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ABSTRACT

The world is faced with a variety of environmental problems. No country has escaped pollution and resource depletion. Basic ecological principles are often ignored and sometimes this contributes to ecological disasters. This volume is designed to provide basic information about the quality of the earth's land resources. The visual aids, worksheets, and activity pages are designed to promote investigative and inquiry experiences, and to foster the use of critical thinking skills through the analysis of environmental problems and solutions. An additional feature is the inclusion of a take-home activity. The activity may be done with simple materials or by conducting a survey. The teaching guide provides suggestions for discussion questions to initiate class participation. Extension activities are also suggested. A research activity that can be used to challenge students and an interdisciplinary activity are provided. This guide contains 12 reproducible hand-outs, a teaching guide, and four overhead transparencies. Topics include the use and types of soil, erosion, rock and mineral resources, fossil fuels, forests, renewability of resources, food production, landfills, public lands, roots, weathering, and soil pollution. A review quiz is also included. (CW)

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Land Resources and Pollution

4 COLOR TRANSPARENCIES, REPRODUCIBLES & TEACHING GUIDE

Grades 3, 4, 5

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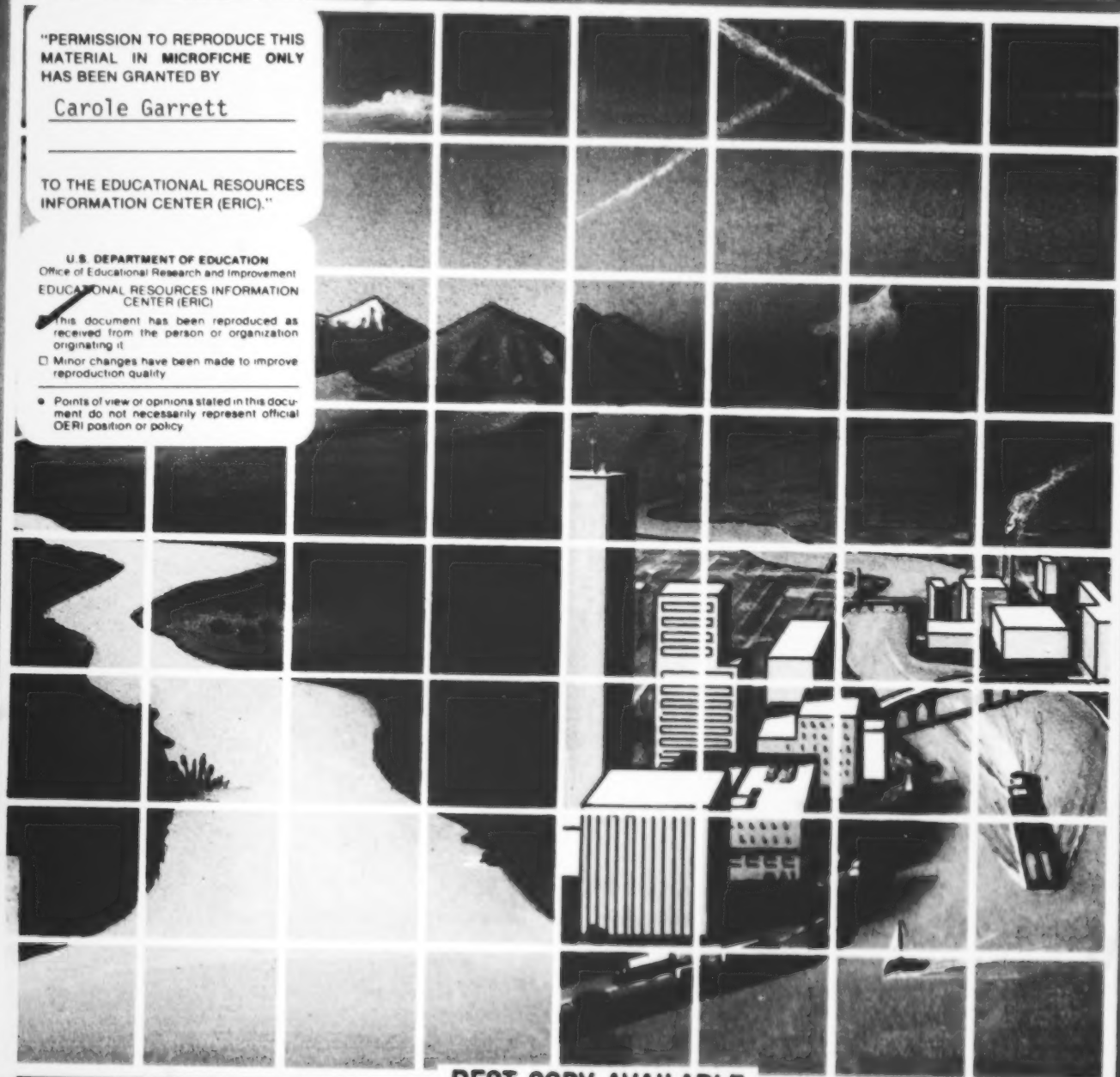

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Environmental Studies

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LAND RESOURCES AND POLLUTION

The world today is faced with a variety of environmental problems. No country in the world has escaped pollution and resource depletion. Basic ecological principles are often ignored and bring about environmental disasters.

This environmental series is designed to assist teachers in developing among their students an awareness of ecological principles and basic concepts of environmental science. The visual aids, worksheets, and activity pages foster investigative and inquiry experiences. The use of critical thinking skills is encouraged as students are guided to analyze problems and suggest solutions.

An additional feature is the inclusion of a take-home activity. The activity is designed to be done with simple materials or by conducting a survey. This will provide an opportunity for parent involvement in the environmental studies.

The teaching guide provides suggestions for discussion questions to initiate class participation in the study of environmental issues. Extension activities are also provided. The research activity can be used to challenge students and the interdisciplinary activity integrates environmental science with other subjects.

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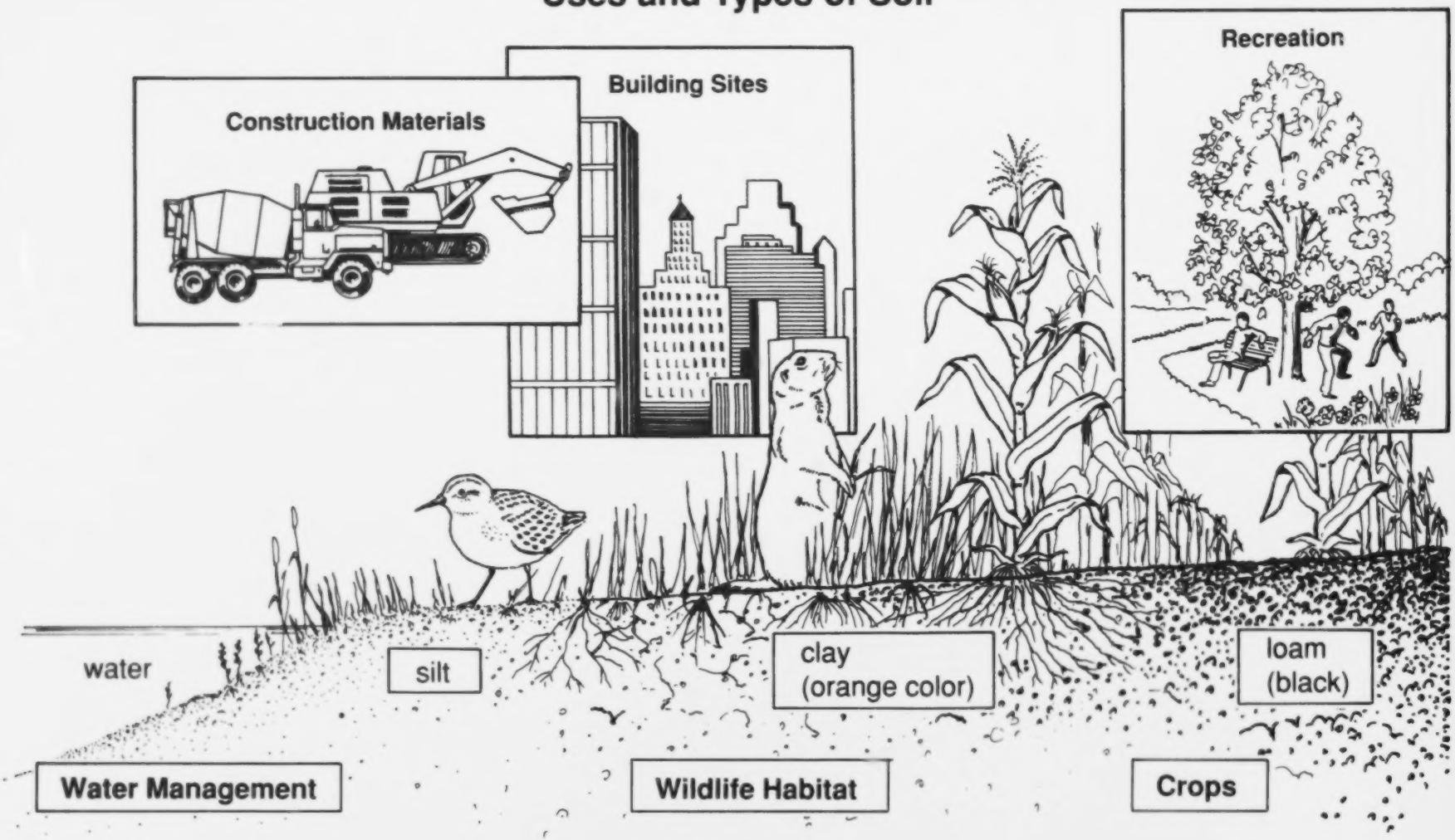
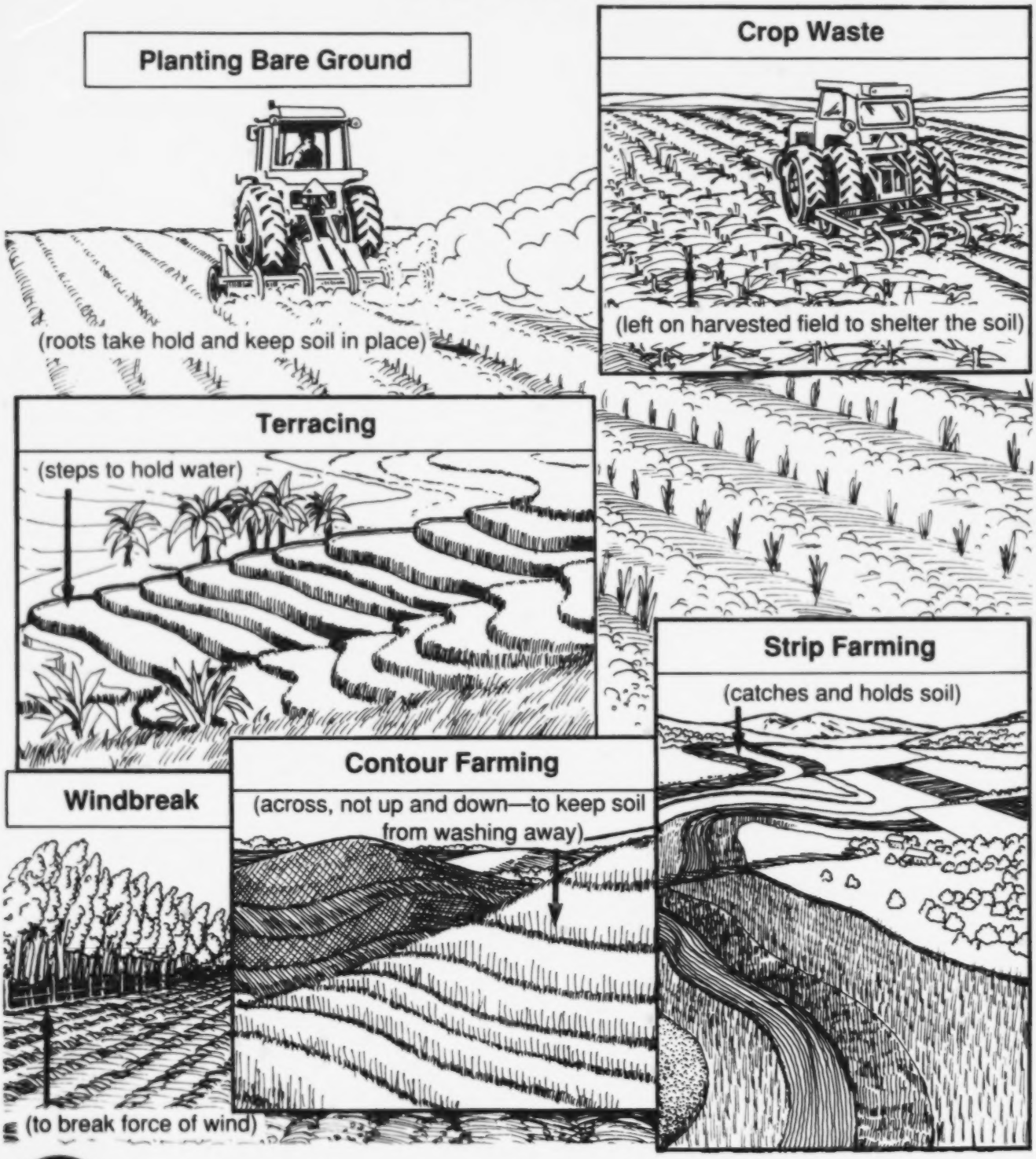
Uses and Types of Soil



Q

1. Which type of soil supports most cropland?
2. Which type of soil provides construction materials?

Erosion Control


Planting Bare Ground
(roots take hold and keep soil in place)
Crop Waste
(left on harvested field to shelter the soil)
Terracing
(steps to hold water)
Strip Farming
(catches and holds soil)
Contour Farming
(across, not up and down—to keep soil from washing away)
Windbreak
(to break force of wind)

Q

1. List steps that help prevent soil erosion.

2. What factors cause soil erosion?

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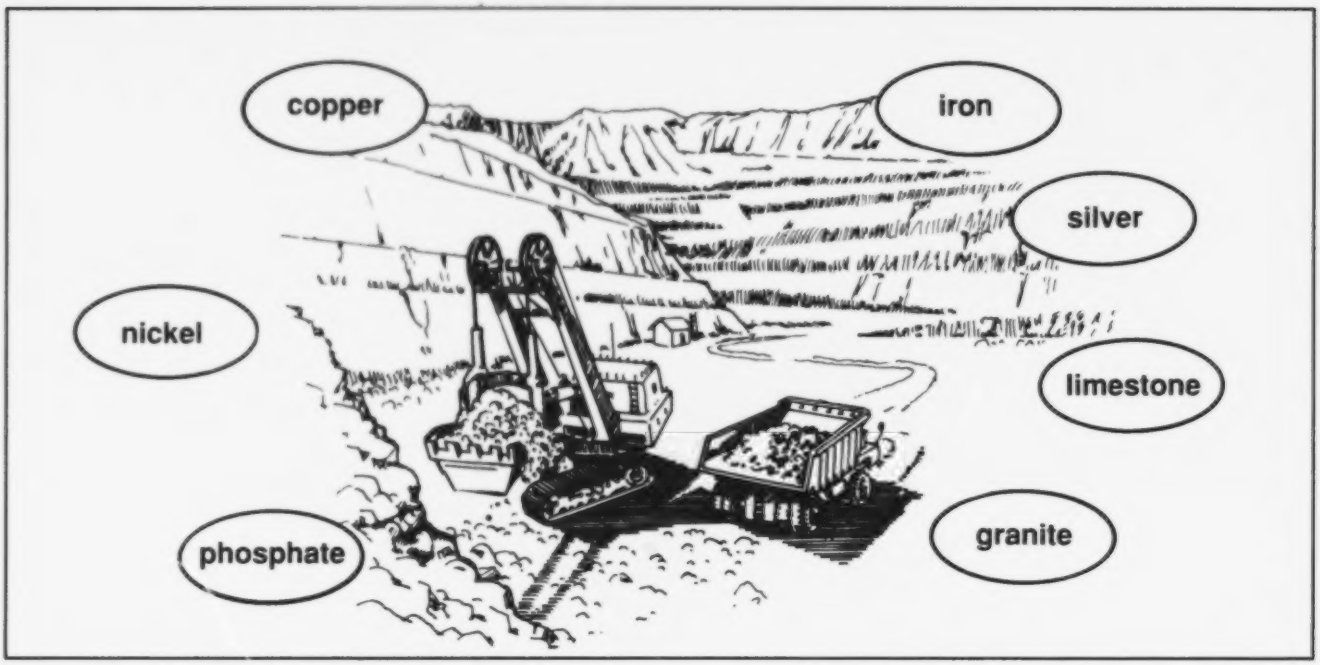
Rock and Mineral Resources



Rocks and minerals come from the earth. They are used to make many things: coins, wire, building stone, jewelry, cement, fertilizer, construction material.

Complete the chart by writing a use for each rock or mineral.

Rock or Mineral	Use
copper	
granite	
iron	
limestone	
nickel	
phosphate	
silver	

Q

1. How might mining change the land?

2. What could be done to return the land to its original condition?

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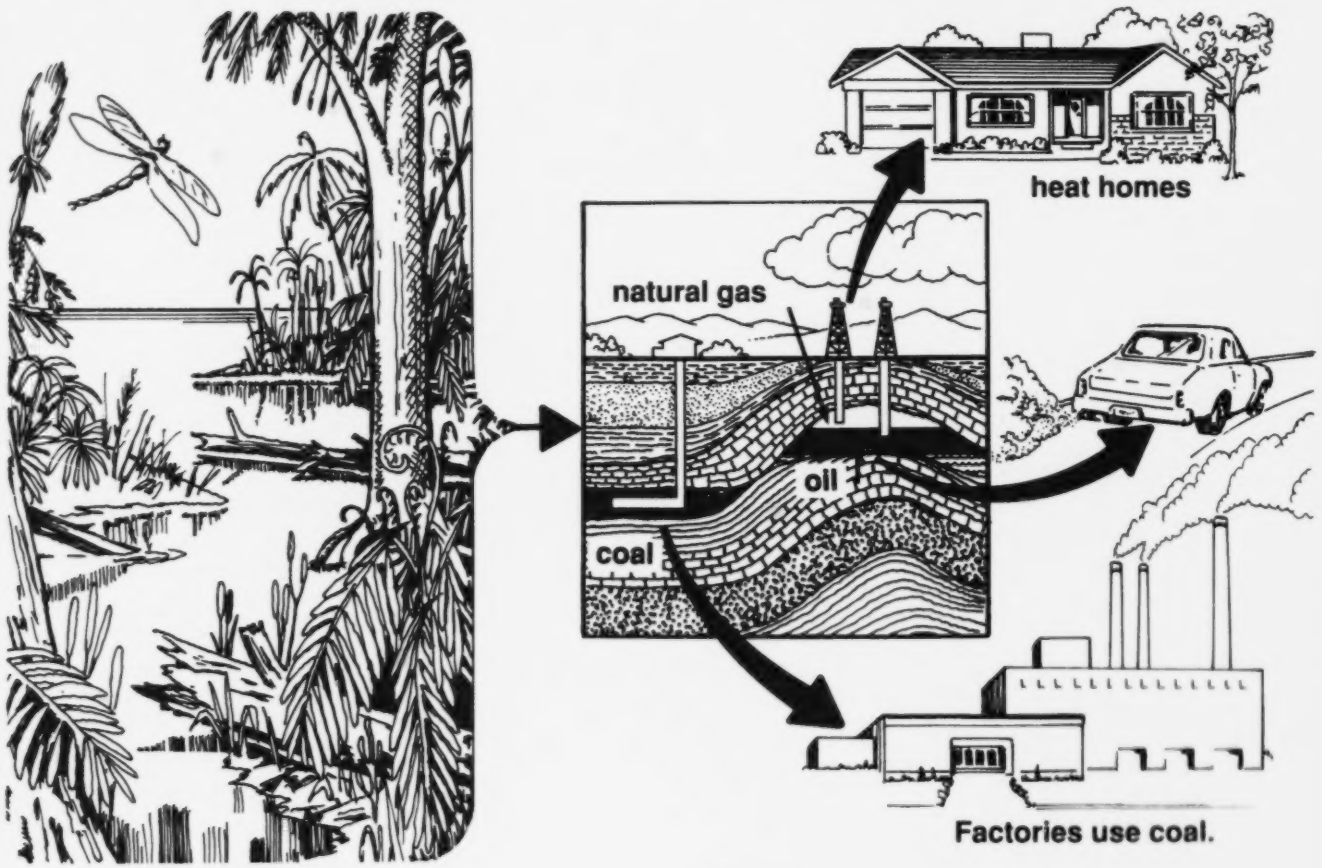
Fossil Fuels: Nonrenewable Resources



Fossil Fuels	Use	Pollution Effects on the Land
coal		
oil		
natural gas		

1. In the first column, write some uses of each fossil fuel listed.

2. In the second column, write what effects the use of each fossil fuel has on the land.

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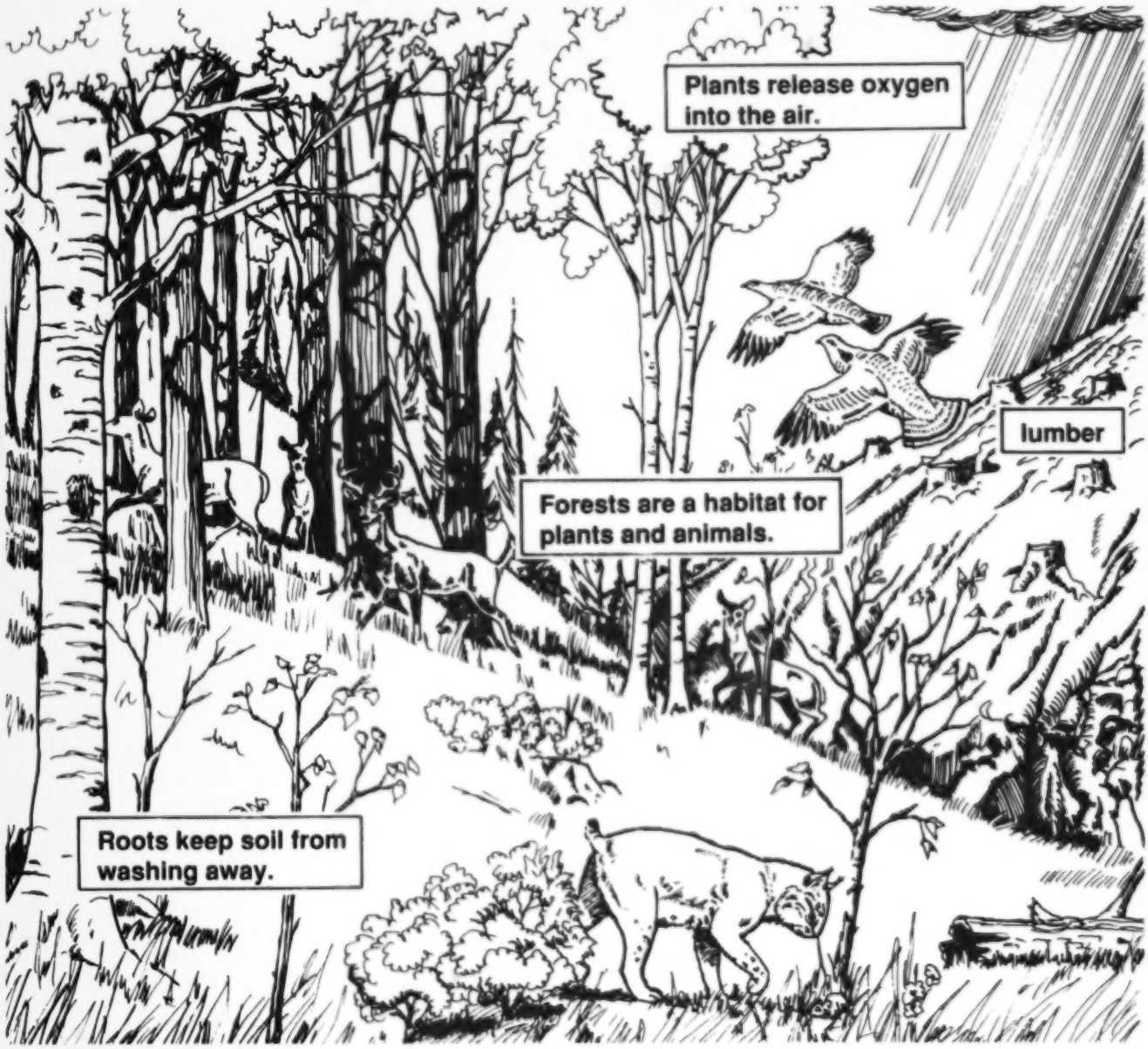
Forests: Renewable Resources


Plants release oxygen into the air.
lumber
Forests are a habitat for plants and animals.
Roots keep soil from washing away.

Forests are renewable resources. Using forests wisely ensures that there will always be this important natural resource. In the picture, circle four resources provided by the forest.

Q

1. Why is oxygen from the forest important?
2. How can the roots of forest trees prevent erosion?
3. List three things that might happen if the whole forest was cut down for lumber.

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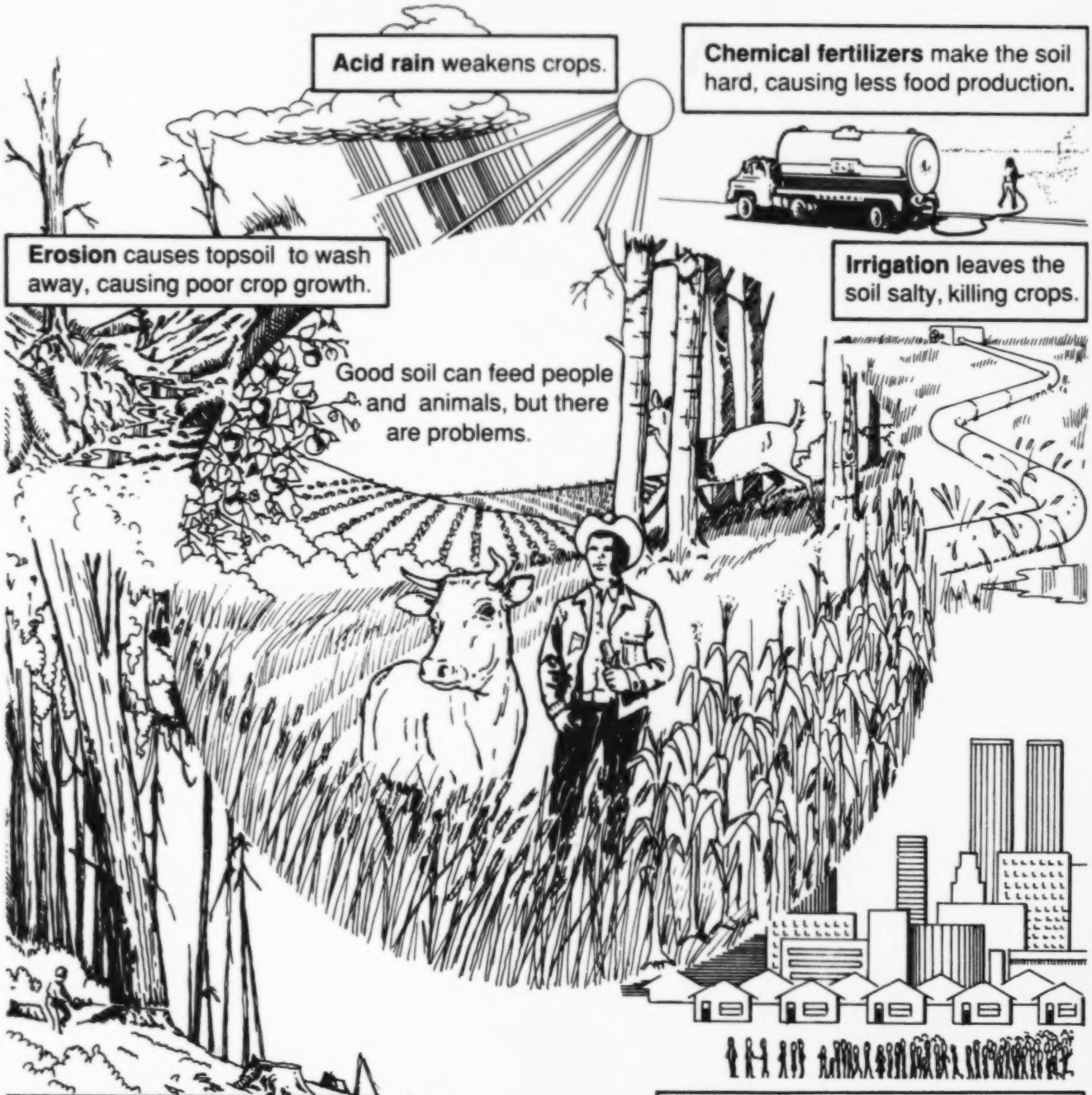
Food from the Land


Acid rain weakens crops.
Chemical fertilizers make the soil hard, causing less food production.
Erosion causes topsoil to wash away, causing poor crop growth.
Irrigation leaves the soil salty, killing crops.
Good soil can feed people and animals, but there are problems.
Croplands from rain forests are soon useless.
More people and more cities mean less cropland.

Q

1. Soil makes food for _____ and _____.

2. How do people harm soil's food production?

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Landfills

Q

1. Which items in the landfill could have been recycled?

2. What form of water pollution could you find at a landfill?

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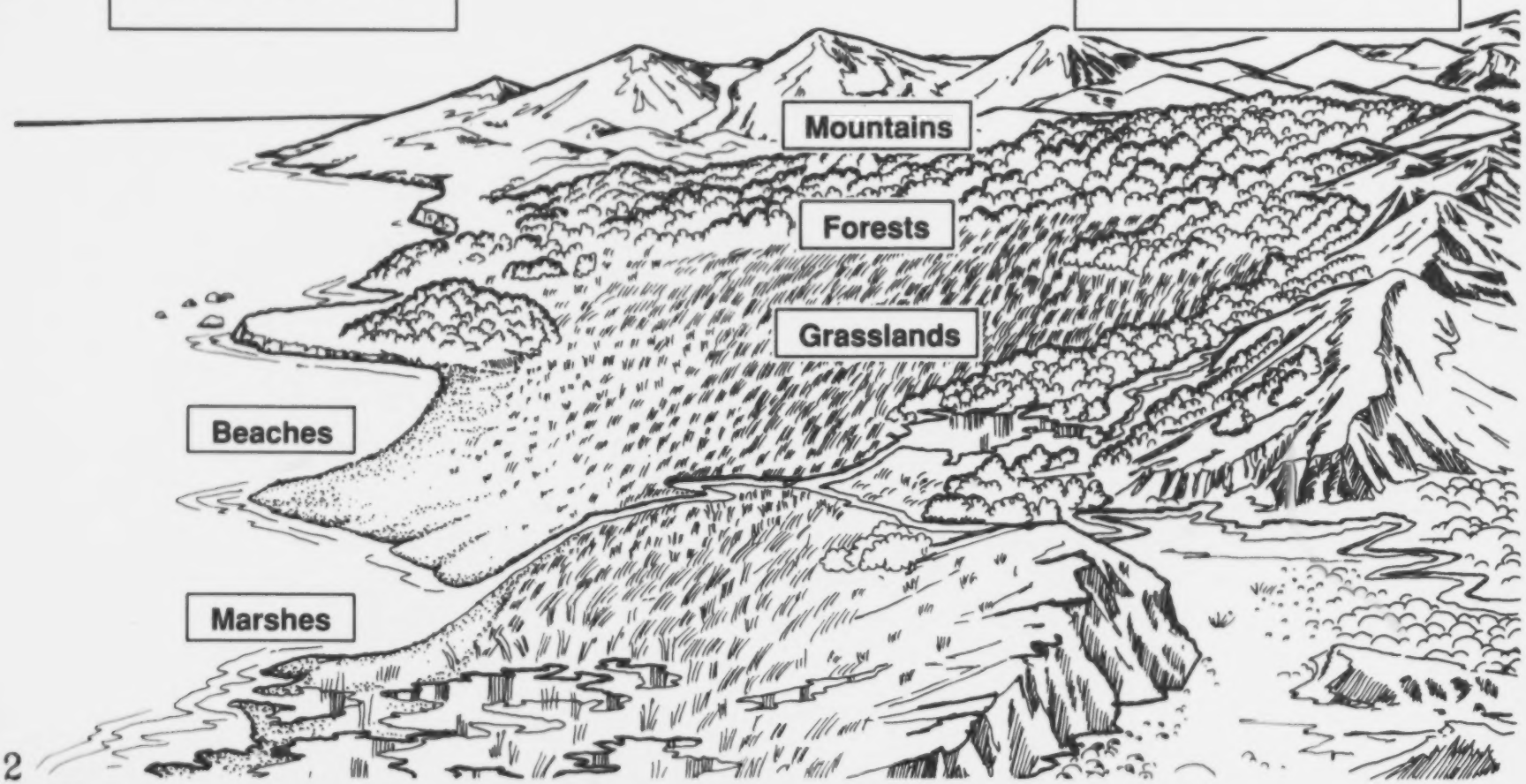
Saving Lands for Public Use

Government
- Soil Conservation Service
- U.S. Forest Service
- National Park Service

Conservation Organizations
- Audubon Society
- Sierra Club
- Nature Conservancy



12

Q

1. Name the five types of natural areas protected by government and conservation groups.

2. Name three organizations that conserve natural areas.

13

Do All Soil Types Hold the Same Amount of Water?

Materials: three large paper cups; paper towels; three small glass jars; measuring cup; small rocks, such as sandstone and granite; dry, dead leaves; peat moss; sand; clay; hammer

Procedure:

1. Prepare paper cups by punching four holes in the bottom center of each cup. Place a piece of paper towel in the bottom of each cup, covering the hole.

2. Mark one cup "sand" and fill with sand. Pack the sand into the bottom of the cup, making sure to fill spaces along the sides.

3. Mark one cup "clay" and fill with clay. Pack the clay into the bottom of the cup, making sure to fill spaces along the sides.

4. Mark one cup "loam." Crush small rocks and mix together with dead leaves and peat moss. Then add a small amount of clay and sand. Pack the mixture into the bottom of the cup.

5. Place each of the three cups on top of a glass jar.

6. Pour one-half cup of water into each paper cup. Wait 30 minutes. Measure the amount of water in each jar.

Results:

1. Which soil did water run through fastest?_____

2. Which soil did water run through slowest?_____

Conclusion:

Which type of soil holds the most water?_____

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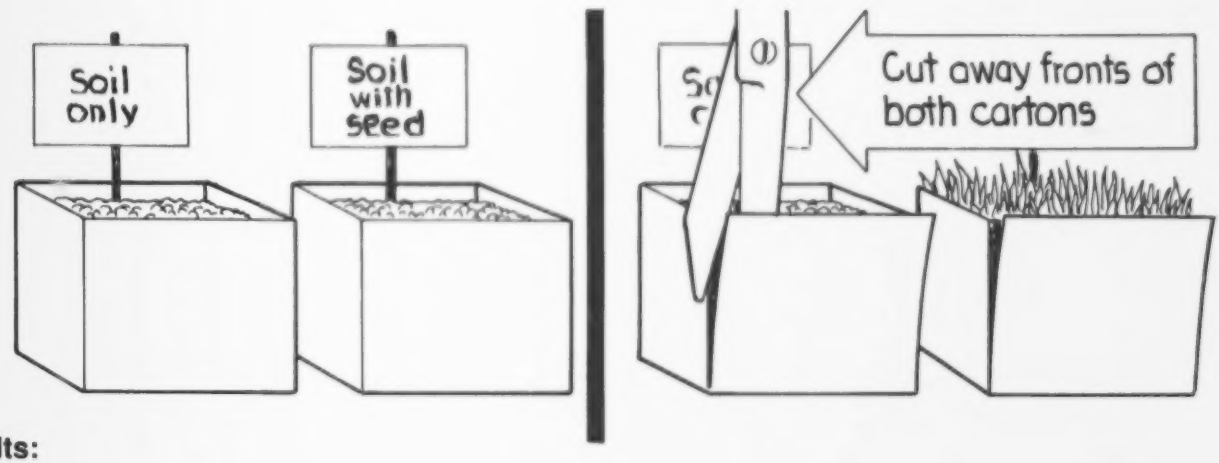
The Power of Roots

Question: How does planting grass seed help in holding soil together?

Materials: 2 cut-down milk cartons, potting soil, grass seed

Procedure:

1. Fill the milk cartons with potting soil.
2. Leave one milk carton with soil only.
3. Plant grass seed thickly in the second carton.
4. Water both cartons regularly.
5. When grass is fully grown, cut away both carton fronts.



Results:

1. Describe what happens when you cut away the carton with dirt only. _____

   _____

2. Describe what you find when you cut away the carton with grown grass. _____

   _____

Conclusions:

1. Which carton holds the soil better? Why? _____
2. Why would you plant grass on a slope? _____
3. Roots hold _____ .

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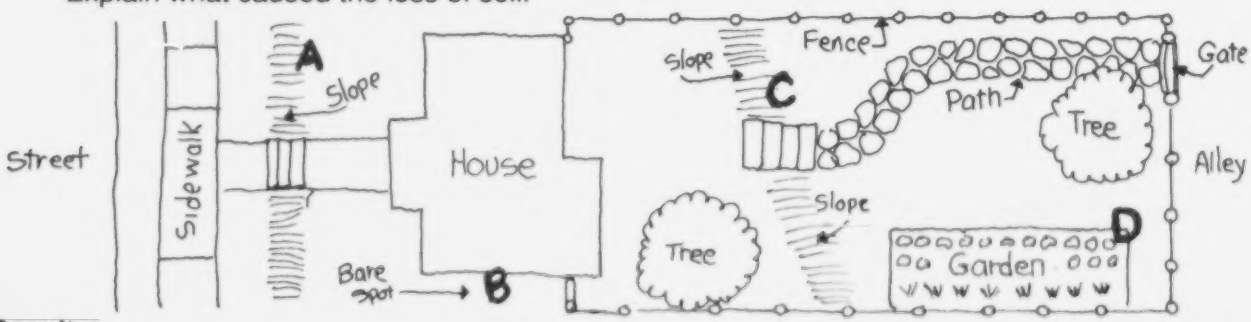
Soil: Going, Going, Gone
Home Erosion Survey

Question: Is the soil washing away (erosion) around your house (or in your neighborhood)?

Materials: crayons, pencil

Procedure:

1. Use the crayons to draw a map of your yard (or your neighborhood).
2. Look for bare spots (especially on hills or slopes) where the soil is washing away.
3. Draw in the eroded spots on your map.
4. Label each eroded spot A, B, C, and so on.
5. Fill in the chart; describe how long and wide each spot is. Tell if the spot is on a slope. Explain what caused the loss of soil.



Results:

Eroded spot	Describe	Cause
A.		
B.		
C.		

Conclusions:

1. What do you think will happen if the erosion continues? _____

   _____ (Check spot again in six months.)

2. What is obviously the biggest cause of erosion? _____
3. Answer on back. What can you do to stop the erosion?

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Review Quiz

A. Circle the correct answer.

1. Forests are renewable resources. T F
2. Cutting rain forests helps save the soil. T F
3. Windbreaks help prevent soil erosion. T F
4. Electricity is one kind of fossil fuel. T F
5. Minerals are a resource from the land. T F

B. Match the letters in column B with the phrases in column A.

A	B
_____ 1. construction material from soil	a. strip farming
_____ 2. rock used to make cement	b. pesticides
_____ 3. erosion control	c. clay
_____ 4. can be recycled	d. limestone
_____ 5. source of soil pollution	e. glass

C. Circle the correct answer.

1. The _____ of rock forms one part of soil.

   farming weathering fertilizing

2. Most croplands are found on _____ soils.

   loam clay sand

3. A mineral resource used to make jewelry is _____ .

   phosphate granite silver

4. A nonrenewable land resource is _____.

   coal trees crops

5. One group of people who help conserve public lands is the _____.

   Athletic Club Sierra Club Automobile Club

D. Answer on back of paper.

What are some things that people can do to prevent pollution of the land?

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Teaching Guide

Background Information for Visuals: Land Resources

Our planet's land resources include soil, forests, minerals, fossil fuels, and wildlife. Together with the air, water, and sun, soil makes life possible. It is the foundation for many kinds of vegetation. Soil also provides homes for wildlife. Soil is a renewable resource; however, it takes from ten to thirty years to create one millimeter of topsoil.

Forests and wildlife are also renewable resources. Although they are capable of reproducing, forests and wildlife have not been able to recover from the effects of *deforestation*, the cutting down of vast regions of forest. The trees and other vegetation cannot grow quickly enough and the wildlife are left without food or cover. Both die. Over the last century, the earth's forest acreage has been reduced by 15 percent. Even by overcutting the forests, 125 million people in developing nations cannot find enough wood to meet their energy needs. The world must develop alternative energy sources before the forests are gone.

Minerals and fossil fuels are nonrenewable resources. The earth's fossil fuels—coal, oil, and gas—were formed millions of years ago. Once these resources are consumed, they are gone for many generations. It will take millions of years for coal, oil, and gas to be formed again.

For Discussion: *Which land resources are renewable?* Soil, forests, and wildlife are renewable resources.

Sources of Soil Pollution

Soils become polluted in many ways. In order to have better harvests, farmers add fertilizers to the soil and spray their crops with pesticides. Some of these chemicals enter into the soil and accumulate there. Often they are not biodegradable and will remain in the soil for a long period of time. Landfills also contribute to soil pollution. Chemicals from the trash seep into the soil. Toxic and radioactive materials may be dumped on the ground or may not be properly stored. Pollutants in the soil may have harmful effects on humans and other organisms. Harmful substances in the soil may become part of the dust a person breathes. This can be a cause of lung cancer. Birds and mammals may die when exposed to toxic chemicals in the soil. Ground water may become contaminated from soil polluted with chemicals.

For Discussion: *How could the soil pollution shown be corrected?* Possible answers: Consumers and businesses should use manufacturers' recommended methods for disposing of chemical, solid, and radioactive waste. They should use only biodegradable products. Companies can develop and farmers can use alternative methods for controlling crop insects, pests, and plant diseases—methods that are not harmful to the soil. Farmers and companies can also practice new methods of fertilizing that do not pollute the land. Governments can design and provide areas for waste disposal that do not allow contents to leak and contaminate the soil. Individuals, businesses, and governments should recycle as many items as possible.

Soil Formation and Erosion

An examination of a handful of soil reveals small rock particles and some organic matter. The physical and chemical processes that break down rocks are called *weathering*. Rocks are weathered by wind, water, ice, the roots of plants, and the various activities of animals. Rocks can be physically broken into smaller pieces by the wedging action of freezing water and by plant roots growing into them. Some rocks are chemically dissolved by running water. These weathered rock pieces become part of the soil. The other parts of soil consist of decayed plant and animal materials. Dead flowers, leaves, and stems of plants and the dead bodies of insects and other animals are decayed by bacteria and fungi in the soil. These organic materials then become part of the soil. Soil is in turn eroded by the action of wind and water. If soil is not covered by vegetation, wind can blow the dry surface soil away in dust storms. The dust may be blown many hundreds of miles. Water can wash soil into streams and rivers.

For Discussion: *What happens to leaves that fall to the ground each autumn?* They decay and become part of the organic matter of the soil. *How can ice cause the weathering of rock?* Water seeps into cracks in rocks; when the water freezes, it expands and causes the rock to crack and break apart.

As Cities Grow. . . Natural Resources Go

Nature has given people many resources: air, water, soil, minerals, plants, and animals. These natural resources help keep people alive and comfortable. We must be careful to use these resources wisely. They can be polluted or destroyed; they will not last forever.

When each new city is built, the soil is covered with concrete and buildings. The topsoil which took hundreds of years to develop is no longer available for crops. Additionally, many minerals people use are deep in the ground, under buildings.

Trees and grasslands are removed to build homes, factories, hospitals, and other structures. Therefore, the wooded shelters and food supplies of birds and animals are gone.

City smokestacks and car exhausts pollute air that was once clean, while waste products from the city pollute waterways.

For Discussion: Make three labels: plants, soil, animals. Discuss these natural resources and have students place them on the *Before* section. Next, have students try to place them on the *After* section where the city has grown.

Students discover that buildings and roads have covered the soil, leaving little space for plants to grow. Without grass and plants, animals have no food supply or place to live. Encourage students to discuss urban conservation: green space, clean air, clean water, and so on.

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Page 1 Uses and Types of Soil

Objective: Identify the uses and types of soil.
Background Information: Sand, silt, and clay are the particles that make up soils. The particular amount of each type of particle in the soil sample determines the soil's texture. Soil rich in clay feels smooth and sticky. It is yellow-brown or orange in color and is impervious to water. Sandy soil crumbles between one's fingers. It is pale brown in color and cannot hold much water. Silty soil, or loam, is rich in partly decayed plant and animal materials. It is black to dark brown in color, and can hold water very well. Loam contains equal amounts of all three soil particles. It is the best soil for gardening and growing most houseplants.

Soil provides many uses: crop cultivation, recreation, building sites, wildlife habitats, construction materials, and water management systems. Construction materials from the soil include: roadfill, sand, gravel, and topsoil. Soil is also used to construct dikes, levees, terraces, and grassed waterways in water management systems.
Directions: Use the background information provided to show students soil types and their uses.
Answers: 1. Most cropland is found on loamy soil. 2. Sandy soil provides construction materials. Some students may know that clay soil also provides construction materials such as bricks and tiles.
Extension Activities: 1. Research the soil texture found around your school by taking a soil sample. 2. Correlate with geography by identifying these loamy soil areas on a U.S. map: the Corn Belt (the region from central Nebraska east to central Ohio, and from central Minnesota south to central Missouri), and the Red River Valley (forming the boundary between Minnesota and North Dakota).

Page 2 Erosion Control

Objective: Recognize possible ways to cut down on loss of soil.
Background Information: Soil is the basic resource needed to produce food for people and animals. In the process of growing crops, however, soil erosion occurs. Steps must be taken to prevent soil erosion.

Rather than plowing up and down hillsides, farmers are urged to plow sideways, following the land's contour. On hilly lands, people can build steplike terraces to hold water, the most powerful force of erosion, and prevent downhill soil loss. Water and soil that wash away get caught by the next row, or terrace, rather than washing down the hill. Farmers should leave crop waste after harvesting to prevent soil from blowing away. Bare ground should be protected by grass, trees, and other cover to prevent erosion by water and wind. Rows of trees, called *windbreaks*, slow the force of wind.

Strip-cropping, in which a cultivated crop like corn or wheat is planted in alternating rows with a cover crop like hay or alfalfa, helps stop erosion. When soil washes away from the row of cultivated crop, it is stopped by the row of ground cover. The following year the crops are reversed. Fertilizing crops with manure instead of chemicals helps deter erosion because manure binds water and soil.

Since being settled, North America has lost one-third of its topsoil. The Soil Conservation Service of the U.S. government offers guidance to farmers and ranchers to help stop soil erosion.
Directions: Use the background information to develop an understanding of how we can prevent cropland from eroding.
Answers: 1. contour plowing, terracing, crop-waste cover, ground cover, windbreak, strip-cropping 2. water, wind, unwise farming practices such as plowing up and down hills
Extension Activities: 1. Research the terrace farming wisely used by the Inca Indians in the Andes. 2. Correlate with math: overgrazing animals in a pasture kills the roots that hold soil. How many cows that need 2 acres each can be wisely pastured on 240 acres?

Page 3 Rock and Mineral Resources

Objective: Identify rocks and minerals as resources that come from the earth.
Background Information: The earth's crust provides important rock and mineral resources for people. Everyday we use rocks and minerals in one form or another. All major industries depend on them. When a particular rock or mineral occurs in the earth in sufficient quantity, it is mined using the most efficient methods. Dredge, open pit, strip, and quarry are methods by which huge power shovels remove rock, soil, and plants covering the area where the minerals occur. Hundreds of thousands of acres are affected in the U.S. and other countries. This destruction of land reduces its value for other purposes. All this waste soil that is dug up to expose the rock or minerals is not usable. Plants will not grow on soil that comes from deep in the ground.

Rocks and minerals should be conserved, for most of them cannot be replaced. Once the coal supply is exhausted, the mining of the area is abandoned and new areas are explored. Mining in the future may take place in the ocean floor, on the moon, or on other planets.
Directions: Initiate a discussion of the identity of the various rock and mineral resources shown. Assist the students in interpreting the illustration before answering the questions. Next, help the students list some uses of rocks and minerals. Let them find some mineral products around them (floors, stairs, cars).
Answers: Chart: **copper**—wire and coins; **granite**—building stone; **iron**—construction materials and wire; **limestone**—cement; **nickel**—coins; **phosphate**—fertilizer; **silver**—jewelry and coins. Additional uses could be added. 1. Waste piles and pits leave the land ugly and unproductive. 2. Answers may vary as to how the land can be reclaimed. Encourage creative solutions, such as fill in the pits and build a playground on the site.
Extension Activities: 1. Research the rocks and minerals mined in your area and the mining methods used. 2. Correlate with social studies to find out what steps your area is promoting to conserve, repair, or reclaim mined areas.

Page 4 Fossil Fuels: Nonrenewable Resources

Objective: Explain why fossil fuels are nonrenewable resources that present problems as a source of pollution.
Background Information: The fossil fuels—coal, oil, and natural gas—are nonrenewable resources. They were formed millions of years ago. Coal can be mined from exposed pits or in underground tunnels. Coal mining can result in unsightly mine spoil or huge piles of earth. This ugly land pollution leaves the land of little value. Erosion of the land can cause dirt to clog streams and kill fish. Oil drilling does not pose the environmental problems that oil pipelines do. Pipeline breaks cause large oil spills and can kill wildlife in the water or on land. Natural gas is the cleanest fossil fuel but the least abundant. Of the three, natural gas causes the fewest environmental problems.

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The burning of fuels causes serious air pollution problems. Health and safety problems also occur. Entire ecosystems are adversely affected. In the early 1900s, coal was widely used. Now natural gas and petroleum products from oil are used more. The demand is great. Many people are becoming concerned. What will happen when fossil fuels run out? One solution is conservation of our present fossil fuel reserves. Another solution is developing more uses for solar energy.

Directions: Introduce the page by defining what is a nonrenewable resource—one that cannot be formed again or takes a very long time to be formed. Contrast this with a renewable resource—one that can be formed or grown again. Explain the formation of the fossil fuels. Mention the methods used in removing the fossil fuels from the earth. Assist students in completing the chart. Conclude with suggestions of solutions to the pollution problem and ways to conserve these nonrenewable resources.

Answers: Possible answers might be: **Uses: coal**—source of energy to run factory machinery; **oil**—lubricate machines, make gasoline; **natural gas**—heat homes. **Pollution Effects on the Land: coal**—gases from burning coal contribute to acid rain, harmful to ecosystems; **oil**—oil spills kill wildlife, harmful to ecosystems; **natural gas**—no recorded problems.

Extension Activities: 1. Research the variety of products that have some form of the fossil fuels in them. 2. Correlate with social studies by indicating on a world map where the fossil fuels are located. Are there any in your area? What is the source of your area's fossil fuel supply?

Page 5 Forests: Renewable Resources

Objective: Recognize that forests are important to the environment and that there are concerns about their future.

Background Information: Forests are found throughout the world. Different kinds of forests grow in different climates of the world. Most of the eastern United States is covered with deciduous forests where trees shed their leaves during the cold season. The western United States has predominately coniferous forests with cone-bearing evergreen trees. Much of Canada is covered by a boreal (northern) forest. The area of the world near the equator is covered by the tropical rain forest. Many environmental problems today center around the planet's forests. Acid rain and other forms of pollution are killing forests worldwide. Fires also destroy huge areas of forest each year. One of the most serious problems threatening forests though, is **deforestation**. This is the clearing away of forested areas for lumber, farmland, pastures, roads, houses, and shopping centers. The world is greatly concerned about the deforestation in the tropical rain forest. Scientists predict that it could seriously affect the earth's climate. Additionally, tropical rain forests have a greater diversity of plants and animals than any other area. Deforestation causes loss of plant life and habitat for animals. The many unique species of the rain forest may be lost to the world forever. These plants and animals (many still waiting to be discovered) might become sources of medicine, food, and other products that are beneficial to people all over the world.

Directions: Introduce the page by establishing what a renewable resource is (one that can be formed or grown again). New trees can be grown again, although it will take many years for the trees to reach maturity. Contrast this with the concept of nonrenewable resources (ones that cannot be formed again or ones that take thousands of years or more to be replaced, such as fossil fuels).

Assist the students in interpreting the illustration before they circle the four things provided by the forest resource. As they answer questions 1 and 2, expand the discussion to include other forests around the world. Conclude with suggestions of what students could do to help conserve forests. (recycle newspaper, practice good camping etiquette including fire prevention, observe Arbor Day by planting trees, and support community organizations that work to conserve forests)

Answers: Four things provided by the forest resource are lumber, oxygen, habitat for plants and animals, and prevention of soil erosion and flooding. 1. The forest trees release oxygen in photosynthesis. We need this oxygen to breathe. 2. The roots, which take up water for the trees to use, keep the soil from washing away. 3. Three things that might happen if the whole forest was cut down for lumber are a loss of a source of oxygen that renews our air supply, a loss of habitat for plants and animals (possibly extinction for those that need the forest to live), and a loss of topsoil from erosion of the hillsides. The students might suggest additional answers, such as loss of recreation areas, food (nuts), or firewood.

Extension Activities: 1. Research the economic and enjoyment values of forests. Newspaper and magazine articles provide current material on deforestation and related problems. 2. Correlate with art by making forest murals including appropriate plant/animal life (deciduous, coniferous, tropical, boreal).

Page 6 Food from the Land

Objective: Help students realize how people harm the soil, which grows food for people and animals.

Background Information: Food for people and animals comes from topsoil, the first eight inches of soil. Topsoil, which originally consists of tiny rocks and minerals, becomes fertile when **humus**, the remains of plants and animals, is added. Topsoil produces grains, vegetables, and fruits that people eat. Topsoil also produces the nuts, grasses, berries, leaves, and so on, that nourish the animals, many of which in turn nourish people. Despite its importance, however, the availability of good topsoil is dwindling.

One-third of the U.S. topsoil has been eroded. It takes 500 years for nature to make one inch of topsoil. Furthermore, by the year 2000, twenty percent of the most fertile U.S. farmland will be urbanized by our growing population. The soil beneath these cities will no longer be available for our use.

Agricultural practices such as using chemical fertilizers ruin the soil's humus and, therefore, its productivity. People need to farm with manure and other organic wastes. Because acid rain also lessens soil fertility, the world must take measures to reduce acid rain.

In the face of rising populations combined with this loss of valuable topsoil, people are taking various measures to increase agricultural space. In many parts of the world, tropical rain forests are being destroyed to make room for farmlands. However, the delicate soil produced by this practice quickly becomes unproductive. Additionally, this practice will lead to the extinction of one million species by the year 2000. A second measure is irrigation. Dry areas produce food when irrigated, but salt remains. A third measure being taken to create more farmland, draining everglade areas, robs countless animals of homes and food. The spectrum of arguments against any of these measures makes it clear that soil conservation is needed.

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Directions: Use the background information to develop an understanding of the importance of soil for producing food for people and animals and how we waste and pollute this valuable resource.
Answers: 1. people and animals 2. People cause erosion, acid rain, increasing populations, and salting and we use fertilizers (which compact soil) and cut tropical rain forests.
Extension Activities: 1. Research the battle to extend farmlands into the Everglades or to preserve the land for wildlife. 2. Correlate with language arts: write to the Soil Conservation Service concerning your state's rank in the amount of topsoil lost.

Page 7 Landfills

Objective: Describe the pollutants created by solid waste disposal in landfills.
Background Information: Eighty percent of the United States' solid waste is dumped into 6000 landfills. Sanitary landfills spread compacted refuse thinly over a small area. The refuse is covered daily with a layer of earth. Some steps taken by operators of landfills to minimize air pollution include prohibiting the burning of trash, sprinkling the landfill with water in dry weather so that lighter debris does not blow away, and erecting litter fences to confine paper and plastics that would blow away. Operators of landfills minimize water pollution by carefully selecting and designing new sites to avoid ground water and surface water pollution. Promptly covering daily deposits also minimizes odors and protects landfills from scavenging animals.

The world is running out of places to dispose of refuse. The solution is to reduce trash at its source. Studies have shown that up to 86 percent of household waste could be recycled. Products that could be recycled include aluminum cans, glass, paper, cardboard, and metals such as brass, copper, and lead.
Directions: Use the background information provided to show the pollutants created by landfills and the attempts to minimize them. Stress the importance of recycling.
Answers: 1. Items shown that could have been recycled are paper, cardboard boxes, bottles, cans, and rubber tires. 2. Ground water and surface water supplies are contaminated from rainwater run-off at the landfill.
Extension Activities: 1. Research the differences between the two types of landfills: trench and area. 2. Correlate with math by drawing a pie graph showing a breakdown of the trash in the United States: 42% paper and cardboard, 23% garbage, 10% glass, 9% metals, 7% plastics, and 9% other.

Page 8 Saving Lands for Public Use

Objective: Describe the public lands that are conserved by federal government agencies and citizen groups.
Background Information: Federal government agencies have been created to protect our land resources. The Soil Conservation Service promotes conservation measures on farm and ranch lands; it offers advice and guidelines to farmers. The National Park Service administers our national park system and maintains habitats for wildlife to ensure the availability of food and shelter for animals. Many national forests, which are administered by the U.S. Forest Service, are located in mountainous country at the head-waters of major streams so that important watersheds are also protected.

Groups of citizens have formed clubs to promote conservation of land resources. These clubs sponsor activities to raise awareness of the need for conservation, influence governmental decisions on environmental issues, raise money for conservation projects, and educate individuals about their own responsibilities and opportunities to help conserve the environment.
Directions: Use the background information provided to show the federal government agencies and the citizen groups that conserve land resources.
Answers: 1. mountains, forests, grasslands, beaches, and marshes 2. the Audubon Society, the Sierra Club, the Nature Conservancy
Extension Activities: 1. Research the formations of the Sierra Club by John Muir and the Audubon Society. 2. Correlate with language arts by writing letters to the Nature Conservancy to request information about their role in preserving public lands.

Page 9 Do All Soil Types Hold the Same Amount of Water?

Results: 1. sand 2. loam Note: Clay may be so impervious to water that none will go through it.
Conclusion: Loamy soil holds the greatest amount of water. Sandy soil holds very little water; water flows right through it. Clay-rich soil did not allow any water or very little water to flow through it.

Page 10 The Power of Roots

Answer: Students will discover that soil is held by the many tiny root hairs. Extend this new knowledge to the value of grass, bush, and tree roots on mountains, slopes, and so on.
Results: 1. Dirt holds together somewhat from watering, but mostly falls apart. 2. The soil is held together by the many roots.
Conclusions: 1. The carton with grass because roots hold the soil. 2. Grass roots keep soil from being washed down the slope. 3. soil

Page 11 Soil: Going, Going, Gone

Answer: Students should be able to find soil being washed away on small slopes between home and school due to wind and water.
Results: Answers will vary.
Conclusions: 1. Gullies will get deeper and wider with more loss of soil. In six months the damage will be more severe. 2. water 3. Plant grass, bushes, and so on so that roots hold soil.

Page 12 Review Quiz

A. 1. T 2. F 3. T 4. F 5. T
B. 1. c 2. d 3. a 4. e 5. b
C. 1. weathering 2. loam 3. silver 4. coal 5. Sierra Club
D. Possible answers include recycling wastes (paper, glass, aluminum, plastic), careful use of pesticides and fertilizers, safe storage of chemicals and radioactive wastes.

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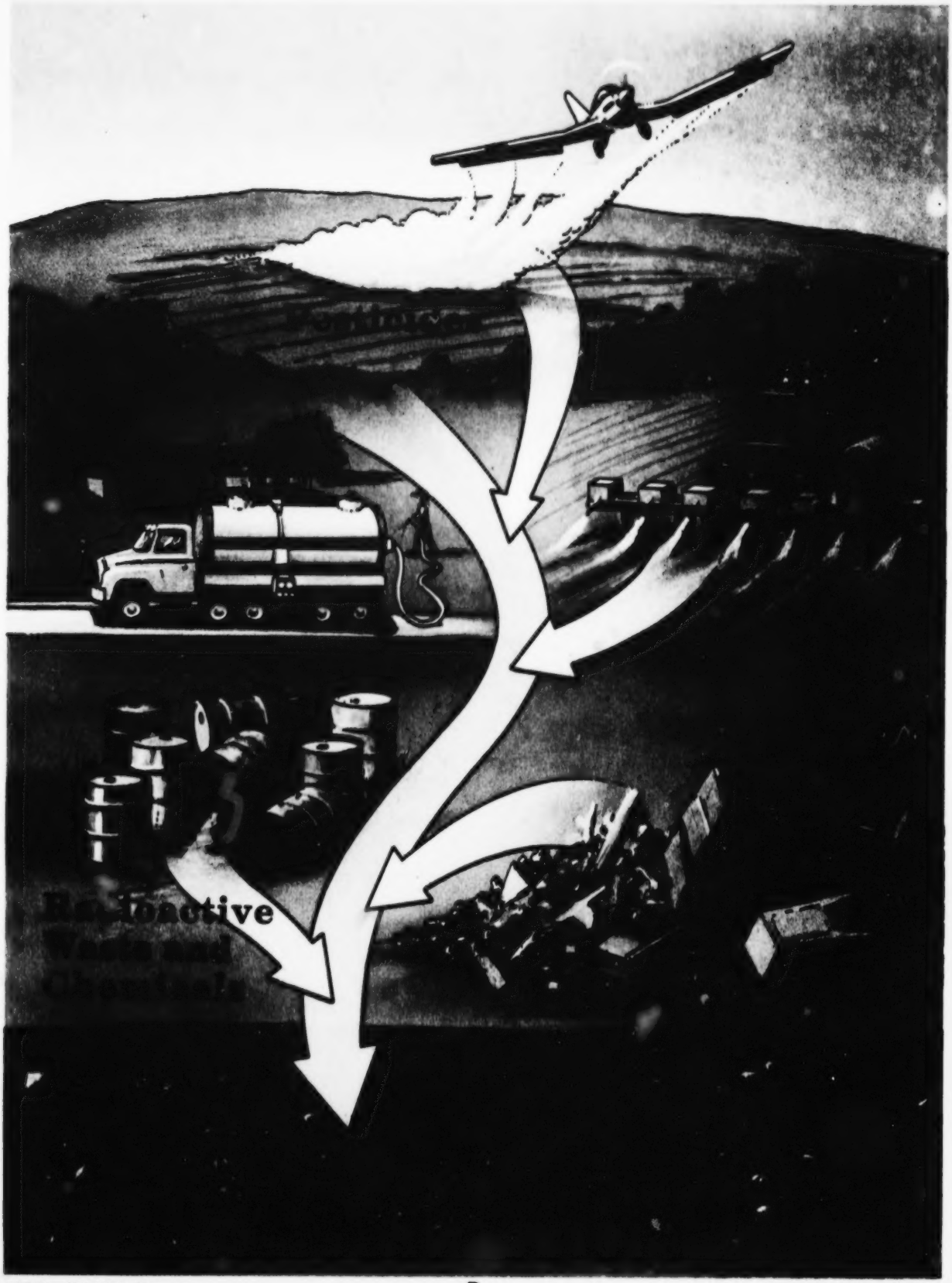

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